

CP EE 2012-13: Modeling Photosynthesis Lab

Name _____

Introduction

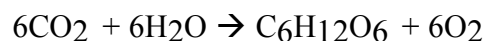
The overall process of photosynthesis produces sugars that store chemical energy.

Some organisms, called producers, make their own carbon-based molecules, such as carbohydrates, that are broken down to make ATP. The process that many producers, including plants, use to make their own source of food is called photosynthesis. **Photosynthesis** is a process that captures energy from sunlight to make sugars that store chemical energy.

In plants, photosynthesis takes place in organelles called chloroplasts. Chloroplasts contain molecules, such as **chlorophyll**, that absorb energy from light. Most of a plant's chloroplasts are in leaf cells specialized for photosynthesis. Photosynthesis takes place in two main stages.

- The first stage is called the light-dependent reactions. In the **light dependent reactions** chlorophyll absorbs energy from sunlight and water molecules are broken down. Energy is transferred to molecules such as ATP. Oxygen is released as a waste product.
- The second stage is called the light-independent reactions. In the **light-independent reactions** energy from the light-dependent reactions is used to build sugar molecules from carbon dioxide.

The overall, simplified chemical equation for the photosynthesis process is:

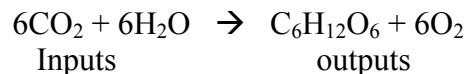


Modeling Photosynthesis

When plants produce food using light energy, the chemicals involved undergo a chemical change or a chemical reaction. The inputs are the reaction of light, water, and carbon dioxide. The atoms in the water and carbon dioxide are rearranged using the energy from the light.

Objective – Problem Statement:

Use the models of the inputs of water and carbon dioxide to produce the models of the outputs, which are glucose and oxygen.



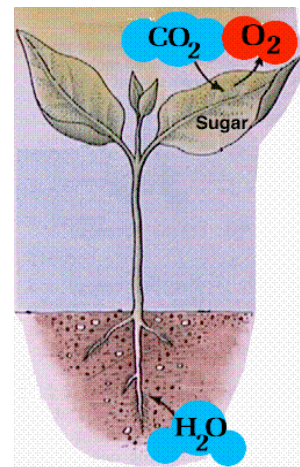
Materials:

Ball and stick kits

Procedure:

In this lab you are going to use the ball and stick models to change the reactant (inputs) from this reaction to make the products (sugar and oxygen).

1. You should start by building 6 molecules of carbon dioxide (CO_2) and 6 molecules of water (H_2O). Each hydrogen atom is yellow, each carbon atom is black and each oxygen atom is red. After you have constructed your 12 molecules, make sure that there are no missing parts, and no leftover parts in your kit. If you have leftovers, or missing parts, let your teacher know.
2. Using the data sheet provided, draw 3-D pictures of all the molecules that you have made.



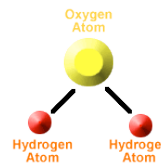
3. Tear apart the molecules and rearrange them to create the products of photosynthesis. The outputs or products of this reaction are glucose ($C_6H_{12}O_6$), and oxygen (O_2).

HINT: Construct a glucose molecule using the following guidelines:

- Black = Carbon ; Red = Oxygen; Yellow = Hydrogen
- 5 Carbon and 1 Oxygen makes a circle
- 4 O-H come off of the circle
- 1 carbon comes off of the circle
- Every hole must be filled in with a bond

Data:

Use the data table provided to draw 3-D pictures of all of the molecules you create.



Analysis Questions

1. Were any of the atoms “left over” after you made the products? What is the Law that determines whether there are any left over atoms? State the law.
2. Which matter cycles that you have studied is this process a part of and where does it fit in?
3. Do you agree or disagree with the following statement? “The products of photosynthesis are very important to humans.” Explain your answer using specific examples to support your position.
4. Did you have to use energy to rearrange the spheres in the models during the photosynthesis reaction? Explain your answer.

5. Do plants need energy to make this reaction happen? If so, where does this energy come from? If not, why not?
6. Which of the molecules that you made during the reaction stores the most energy?
7. Using abbreviations, write out the chemical formulas involved in the chemical reaction known as photosynthesis.
8. What are the names of the chemicals that go into a plant so that photosynthesis can happen?
9. What are the names of the chemicals that are produced by the plant during photosynthesis?
10. Did you need to create or destroy any of the “atoms” to do this lab? Does a plant create or destroy atoms during photosynthesis? Explain your answer.
11. During photosynthesis energy is transferred. What kind of energy goes into a plant? Where does that energy go? Explain the energy transfers that occur during photosynthesis.
12. Briefly state what you learned about photosynthesis through this lab.